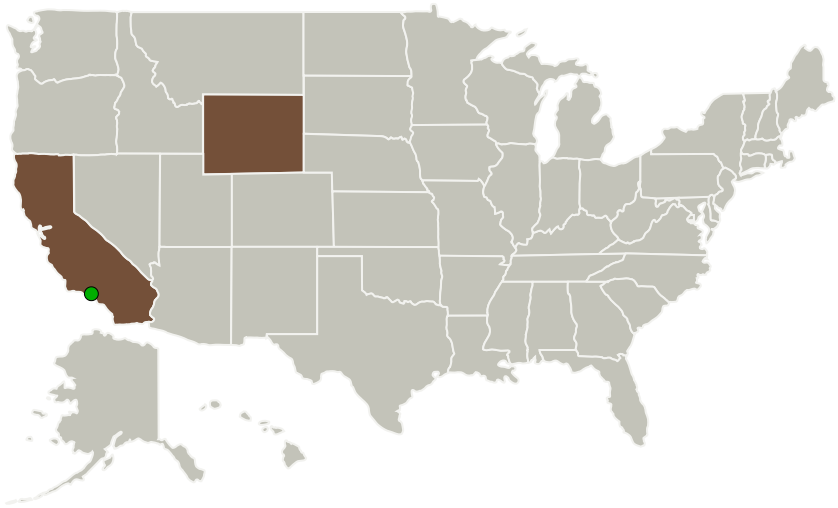
Active Ankle for Use with Microspine Gripper, Phase I

Completed Technology Project (2012 - 2012)

Project Introduction

Asteroids and comets are fascinating members of the celestial order. These objects provide a unique window into the composition of the original solar nebula and offer clues on how this nebula evolved into planetesimals and eventually into planets. Further, these "small solar system bodies" are thought to have served as the mechanisms that brought water to the Earth and, possibly, the organic molecules that served as the building blocks of life. To help uncover the secrets these bodies hold, NASA has prioritized exploration missions to study the surfaces of near earth objects. However, the small mass of asteroids and comets provide only a fraction of the gravitational force produced on earth. Consequently, robotic mobility technologies currently employed are fundamentally incompatible with these missions. An innovative concept for an active foot that allows a walking robot to anchor itself to the surface with each step is proposed. By combining an omni-directional microspine gripper with an actively actuated ankle, the system will provide the dexterity necessary to conform to variable surface topography, engage and disengage the gripper from the surface, quantify the quality of attachment, and insulate the gripper from the disruptive motions of the robot as it moves. A basic prototype will be built and tested in Phase I, and the development and integration of a fully functional first article system will take place during Phase II.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Sqaure One Systems Design, Inc	Lead Organization	Industry	Jackson, Wyoming
Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations	
California	Wyoming

Project Transitions

February 2012: Project Start

August 2012: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/137943)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Sqaure One Systems Design, Inc

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

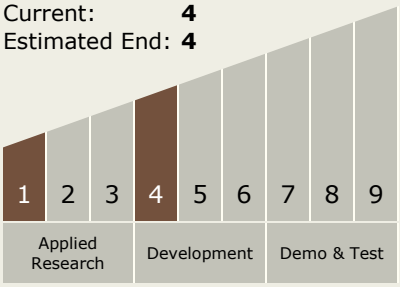
Carlos Torrez

Principal Investigator:

Robert Viola

Technology Maturity (TRL)

Start: **1**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX04 Robotic Systems
  - TX04.5 Autonomous Rendezvous and Docking
    - TX04.5.5 Capture Mechanisms and Fixtures

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System